THE AMERICAN OIL CHEMISTS' SOCIETY

JOURNAL OF OIL & FAT INDUSTRIES

Vol. I JULY, 1924 No. 1

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Published by The American Oil Chemists' Society, Easton, Pa.

Application for entry as second class matter made at the postoffice at Easton, Pa.

Contributions for the Journal should be sent to the Editor, Herbert S. Bailey, P.O. Box No. 756, Savannah, Ga. Subscription and Membership Dues should be paid to the Secretary-Treasurer, Thos. B. Caldwell, Law & Co., Wilmington, N. C.

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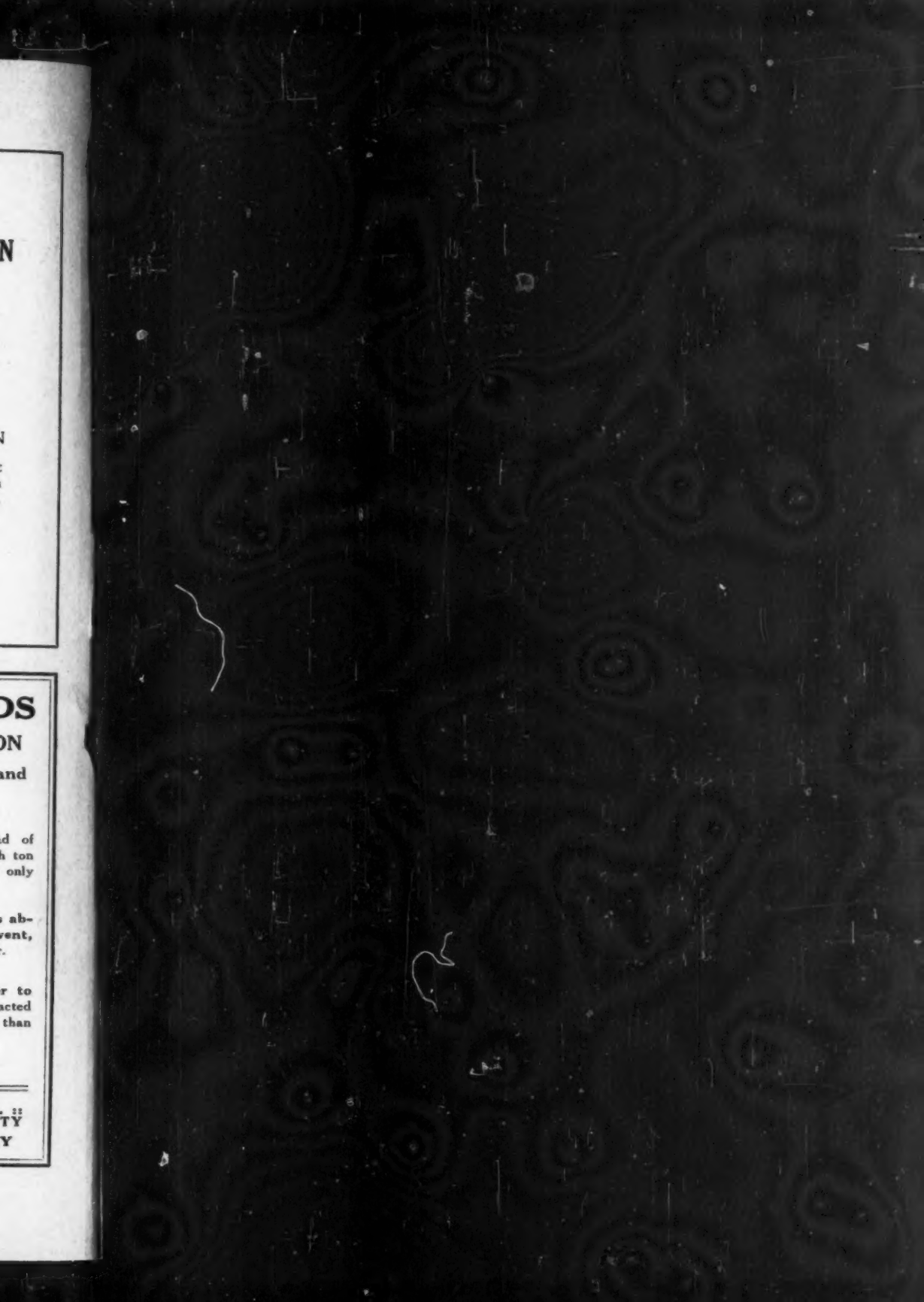

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Journal

of

Oil and Fat Industries

Published by

The American Oil Chemists' Society

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Papers offered for publication should be sent to the Editor, Herbert S. Bailey, Box No. 756, Savannah, Ga.

All matters relative to advertising are handled by Mr. Fred H. Smith, Georgia Experiment Station, Experiment, Georgia.

The *Journal of Oil and Fat Industries* is issued quarterly. The first two numbers, July and October, 1924, will form Volume I. Beginning January, 1925, each volume will consist of four numbers, a total of at least 128 pages.

The subscription price of the first volume, 2 numbers, will be $1.00, and of Volume II, four numbers, $2.50, paid in advance. All members of the American Oil Chemists' Society will receive the Journal without any increase in their present dues. Subscriptions should be sent to the Society's treasurer, Thos. B. Caldwell, Care Law & Co., Wilmington, N. C.

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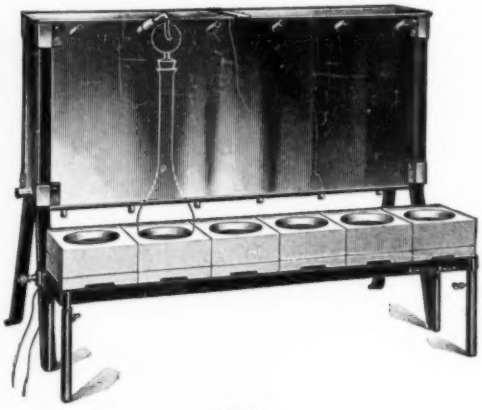

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Journal of Oil and Fat Industries

Devoted to Oils, Fats and Allied Industries

VOL. I **JULY, 1924** **No. 1**

EDITORIALS

"DEFINITE OBJECTIVES DEFINITELY ARRIVED AT"

PRESIDENT'S MESSAGE

By H. J. Morrison

The first duty confronting a new administration is the formation of the committees for the new year.

The question arises—Are all the committees of the past few years necessary, desirable, and are they working to the best advantage? Some committees have made recommendations which have not been acted upon; others have worked not knowing in detail what the former committees have done; while still others have been so ambitious and cut out so much work that they have not been able to reach a definite end-point.

This is not due to lack of appreciation on the part of the Society as a whole or to the unwillingness of former committees to assist the new ones, nor is ambition to be condemned. The cause is lack of system, lack of coördination, lack of a continuing head due to change of officers.

We will make an attempt this year to correct this situation.

We have named a Planning Committee whose duty it will be to originate the subjects to be investigated, plan the work to be done to make a finished job. They will schedule what portion is to be done each year, passing on the data if it is found necessary or desirable to change the personnel and, finally, to see that recommendations are considered seriously and acted upon definitely. This committee will also see that the data collected are filed properly in a suitable archive.

The members named on this committee will be found elsewhere. It will be noted that most of the major phases of oil and fat technology now represented in our membership will be covered by a man well versed in one at least of these lines. Thus, general refining problems, oil mill technology and questions arising between buyer and seller of cotton seed products, technology of imported oil, fats and oleaginous materials, animal fats and greases and soap materials are all represented. Others

with particular knowledge of other lines of oil and fat technology will be added as membership in such lines increase and desire such representation.

It is our hope to head up our investigational work in such a manner that we will be continuously going forward and not in circles or treading old beaten paths. Our slogan will be "Definite Objectives Definitely Arrived At."

A. O. C. S. Committees for 1924-1925

As appointed by H. J. MORRISON, Pres.

Membership Committee: J. J. Vollertsen, Vice-Pres., Chairman; A. W. Putland; R. K. Brodie; Glenn Pickard; Thos. Caldwell, Sec. and Treas.

Planning Committee: David Wesson, Chairman; G. Worthen Agee; I. F. Laucks; H. J. Morrison; J. J. Vollertsen.

Uniform Methods Committee: F. B. Porter, Chairman; J. J. Vollertsen; David Wesson; H. C. Moore; W. H. Irwin.

Ammonia Committee and Smalley Foundation: H. C. Moore, Chairman.

Bleach Test and Fuller's Earth Committee: A. W. Putland, Chairman.

Coöperative and Research Committee: E. R. Barrow, Chairman; David Wesson; L. M. Tolman; C. B. Cluff; P. S. Tilson; H. J. Morrison.

Oil Characteristics Committee: Geo. S. Jamieson, Chairman; H. S. Bailey; H. P. Trevithick; W. H. Irwin.

Refining Committee: C. B. Cluff, Chairman; J. Henry Allen; R. H. Fash; H. P. Trevithick.

Spent Fuller's Earth Committee: P. P. Hindelang, Chairman; P. S. Tilson; W. D. Hutchins; G. Worthen Agee; Jas. W. Battle.

Standardization of Lovibond Colorimeter: H. P. Trevithick, Chairman; H. S. Bailey; E. M. James; Thos. Law; G. Worthen Agee; A. W. Putland.

IVORYDALE, OHIO,
June, 1924

AT LAST A JOURNAL DEVOTED TO OILS AND FATS

This, the first issue of the JOURNAL OF OIL AND FAT INDUSTRIES, contains most of the proceedings of the fifteenth annual convention of the American Oil Chemists' Society. Such committee reports as were available before the convention were printed in the April and May issues of the Chemists' Section of the *Cotton Oil Press*. The report on oil characteristics was published under the caption Analysis of Authentic Commercial Corn Oils, by Dr. Geo. S. Jamieson, and Mr. W. F. Baughman, of the U. S. Bureau of Chemistry. This, and the Editor's report by Herbert S. Bailey appeared in the April *Press*. In the May number were published Mr. T. L. Roettger's report on Methods for Seed Analysis, Mr. H. J. Morrison's report for Refining Committee, Mr. P. P. Hinderlang's report on Spent Fuller's Earth Extraction and Mr. H. J. Morrison's report as Chairman of the Membership Committee. Because of the limited space available in this issue of the JOURNAL it has been necessary to leave over until our

second number some of the most interesting papers which formed a part of the New Orleans convention program.

The American Oil Chemists' Society is a direct, linear, descendant of the Society of Cotton Products Analysts, which in turn was formed by the group of chemists associated with the Interstate Cottonseed Crushers' Association. Until comparatively recently there has been little effort made to broaden the field covered by the activities of the Society. The reports and papers appearing in this issue of the JOURNAL might seem to indicate that our members were concerned only with that phase of the oil industry which is connected with the production of edible vegetable products. While it is true that the majority perhaps are interested primarily in the cotton-seed oil business we already include within our ranks, several chemists of the soap, paint, and other technical branches of the oil and fat industries. One reason for undertaking the publication of a new journal was a feeling that it would materially help in broadening the activities of the Oil Chemists' Society. That by issuing regularly a journal devoted to all phases of the animal and vegetable fat and oil fields, those chemists who now find little interest in these particular lines in the proceedings of other chemical societies would be drawn together into one organization.

It has seemed advisable to begin in a small way, with comparatively few pages, printed at rather long intervals instead of undertaking a monthly publication with a larger number of pages which at first might have to be filled with mediocre material. The Board of Editors will be composed of specialists in the different branches of glyceride chemistry and technology. Aside from abstracts of articles appearing in journals not generally accessible to our members, nothing will be published in these pages which is not thought to be original and authoritative. For a time, at least, the majority of articles will be on subjects related to cottonseed, cocoanut, and corn oils and their by-products, but we confidently hope to secure valuable papers relating to linseed and other technical oils, the chemistry and manufacture of soaps, colloid chemistry, as it bears directly upon the problem of fat and oil refining, and articles dealing with the nutritive value, and various uses of all kinds of glycerides.

There is a very evident need for a first class journal in the English language broad enough in its scope to cover all phases of the chemistry and technology of edible and inedible fats, oils, and greases, at the same time sufficiently limited so that the scientific investigators, works' chemists, engineers, and managers will not find it necessary to peruse a large volume of literature in order to find a few pages on the subjects in which they are specifically interested. As the field of chemistry grows, the number of contributions offered for publication in such journals as those of the American Chemical Society, The British Chemical Society, and the Society

of Chemical Industry rapidly increases. A natural consequence of this rapid multiplication of records of laboratory researches and plant problems is a delay, often of many months, in the publication of valuable material. Because of the restricted field covered by the JOURNAL OF OIL AND FAT INDUSTRIES, papers accepted for publication can be printed within a short time after they have been passed by the Board of Editors, thus rendering a distinct service to both the authors and their fellow workers. Although started as a quarterly, this JOURNAL will undoubtedly require monthly publication within a short time. If it proves its worth and meets the demand which apparently exists for a journal in this particular field, sufficient papers will undoubtedly come without solicitation to its editors and an increase in advertising and the additional members to the American Oil Chemists' Society will provide requisite funds for a better and bigger journal.

PROCEEDINGS OF THE FIFTEENTH ANNUAL CONVENTION

PRESIDENT'S ADDRESS

By H. B. Battle

1. **Journal of the Society.**—I think the main thing for us to consider at this time is the importance of a separate Journal for the Society. It will be the best forward step we can take, and to my mind is a necessity. With all our work and investigations, and reports of committees, we should have the means for properly preserving them, so we can present them to the scientific world in a form easy of preservation and reference. It is true that these reports in the main have been printed in the columns of the *Cotton Oil Press*, yet this plan is so foreign to the Journals other Societies publish, that we have always suffered in the contrast.

Therefore it seems that there is no more outstanding thing for us to do, than the establishment of such a Journal. In fact we have existed too long without it. Even if we have now to make sacrifices, we should take this step without further delay. The Special Committee formed at the last meeting for investigation and report to the Governing Committee, will shortly present its findings. It is hoped that the Governing Committee will recommend to the Society a practical plan for the consideration of the meeting. I am sure that each one of us thoroughly understands the great importance of this matter, and will do his utmost to assist in its proper solution.

We are very fortunate in having such a valuable and experienced Editor in Mr. H. S. Bailey, who will have charge of the Journal when it is started. To his faithful, loyal and efficient services in the past, the Society owes much, and it is very fitting that I should officially make this expression.

2. **Enlarged Membership.**—Those who have studied most carefully the existing conditions as to future growth of our Society, have recognized for some time that we are not adding to our membership and growing as we should. We have to a great extent secured membership from practically all in the Oil and Fat Industry, and several of the allied industries. But we are rather specialized in our field, in fact too much so, and the time has doubtless come for us to increase the scope of our undertakings so as to embrace others interested in lines of work similar, if not allied to that in which we are engaged. At the present time our special industry, like many others, could present a much more hopeful prospect of present-day success. A number of important changes in large companies during the past year only illustrates the inevitable result of the absence of the rainbow hue in our path ahead. We much fear that we will lose a number of mem-

bers resulting from these untoward conditions. It is then the part of wisdom to provide for such inevitable changes by bringing in other lines of industry which are not now particularly stressed in our existing constitution and by-laws although included in them.

3. Official Chemists.—As is known to several of our members, a peculiar incident has recently occurred, the result of which has clarified a situation which was quite obscure to several high officials. The final result cannot but be of benefit to our Society. It is unnecessary to give the details of this matter other than to say that several very important results have followed from the incident. The Interstate Association and its officers are now fully informed as to what constitutes an "Official Chemist" in the Interstate Association. They now so thoroughly understand the term that they have decided to print in the Annual Rules Book of the Association, the names of its Official Chemists, classifying them according to the lines in which they are certified. This will be a most direct and complete recognition of the American Oil Chemists' Society by the Interstate Association, and brings before all a very definite understanding of just what constitutes Official Chemists. It is just as well to repeat these requirements: They must be—

1. Active members in good standing of The American Oil Chemists' Society.

2. Referee members in good standing in The American Oil Chemists' Society, and holding for the current year a Referee Certificate issued by the Referee Board operating through the authority of the Society.

3. Members in good standing of the Interstate Cotton Seed Crushers' Association. If chemists or laboratories possess all three of these requirements then their name will be printed in the Annual Rules Book of the Association, and classed as "Official Chemists" of the Interstate Association, to the extent of their individual certification.

The Society is to be congratulated upon this very important recognition, and the further clarification of a very uncertain status in the past.

4. Vice-Presidents.—At the last meeting, the Society very wisely determined to increase its number of officers by the addition of two Vice-Presidents, and to make them ex-officio members of the Governing Board. By this action, the general membership of the Society is more fully recognized, and is brought into more active participation in the affairs of the Society. These Vice-Presidents as are the similar officers of the Interstate Association, are elected annually, and thus bring in new men and ideas, and tend to materially widen out a more general knowledge of the active working of the Society.

I wish to commend the activities and helpfulness of the two elected in 1923, Messrs. Hinderlang and Mays. They have materially assisted in

the deliberations of the Governing Board, and I wish now to thank them most heartily for their presence and active assistance.

5. Associate Membership.—It would seem that it is quite desirable to interest our Associate members more in the operations of the Society. This class of membership includes individuals, firms and corporations who may be interested in oils, fats, waxes or allied industries. A number of the larger companies, by becoming associate members of our Society, not only add numerically to our membership as well as to its receipts, but also provide an active endorsement of our ideals and work. It is only but just that we should duly recognize all of this, not only in showing them our appreciation, but where advisable giving them the opportunity of presenting before us the result of their own investigations, which is shown in their new developments of processes, materials, machinery, appliances, apparatus, etc. It is very fitting that we should be fully informed of any new advances in their line of work in addition to what we ourselves report through our various committees. We have therefore made it a point to especially invite our associate members to our meetings, and have provided a place for them in our programs. The readiness with which they have accepted the opportunity, proves that the step has been a wise one.

In furtherance of the ideas just presented, I suggest the formation of an annual committee to be named by the President, as other committees are, to be known as the Industrial Committee. The duties of this committee will be to keep in touch with all new advances in any lines of endeavor of particular interest to our Society, and to report regularly to the Society the result of their findings, the same to be printed in our JOURNAL. By this means our members will be provided with advanced and timely knowledge of important steps and improvements.

6. Membership Losses.—It is not pleasant to record the loss of any one of our members through any cause, but I think it is eminently proper that we express our regret at the resignation of Mr. G. G. Fox, who as its Sixth President presided over the Society during the year 1915–16. Only once before have we had occasion to record the loss of active participation of a Past President, which was through the death of Dr. Smalley, our Fourth President. Just a few months ago Mr. Fox, in his New Year's words of cheer and encouragement in the January Chemists' Section, sent his greetings to the membership in well chosen and timely words. We now reciprocate these pleasant wishes, and we earnestly hope for Mr. Fox in his new line of activity the abundant success which he eminently deserves. He has always been a valued member of the Society, and was an especially valuable and progressive executive during the period of his administration, and thereafter upon the Governing Board.

7. Conclusion.—For myself, I wish to extend to each member of the Society my cordial thanks for their coöperation during the past year. I

have felt that we were all working along the same line, and desired most of all the best forward movement for the Society, and a decided increase in its prestige and growth. I have appreciated greatly this generous help. I cannot say that we have done any great things during the year, but we have had ideals, and in endeavoring to carry them out, I together with your other officers have not spared ourselves in hard work and close attention to our duties. I do not know as to the outcome, except what relates to myself, and I feel sure that I am better for having been associated in the Society as its past ranking officer, and I feel that my efforts have certainly improved my own self, even if they have not gone further. For the privilege of doing this work for the Society and for each member of it, I wish to extend my grateful thanks. I trust that the future will bring very encouraging growth, and that the Society will become still more prominent in affairs of the scientific world, and bring still greater credit to its members.

I bespeak the same coöperation to my successor that you have shown to me, and I trust you will so support his administration that it will prove the best we have ever had.

THE BATTLE LABORATORY,
MONTGOMERY, ALA.,
May, 1924

SECRETARY-TREASURER'S REPORT 1923-24

BY THOS. B. CALDWELL

FINANCIAL STATEMENT

April 30, 1924

Receipts:

Cash on hand, April 30, 1923			$ 753.14
Accounts Receivable, April 30, 1923			22.39
Dues Collected, 1922–23	1 Active Member		6.00
1923–24	214 Active Members		1,284.00
1924–25	29 Active Members		174.00
1923–24	33 Corp'n Members		330.00
1924–25	12 Corp'n Members		120.00
Sales, Fuller's Earth, 145 cans			116.00
Moisture Dishes, 503			30.18
Standard Salts, 47 bottles			47.00
Fees, Referee Certificates, Individual	1923–24		20.00
Corp'n	1923–24		65.00
Individual	1924–25		22.00
Corp'n	1924–25		70.00
Oil Samples, 1923–24			290.00
Check Meal Samples, 1922–23			15.00
1923–24			1,050.00
Interest on Liberty Bonds			17.00
			$4,431.71

Disbursements:

Accounts Receivable, April 30, 1923, charged off	14.00	
Printing	36.25	
Office Expense	410.32	
Convention Expense, 1923	395.81	
1924	9.70	
Fuller's Earth Expense (cans)	22.77	
Oil Samples Expense	143.45	
Check Meal Samples Expense	493.10	
H. C. Moore, Chairman, Smalley Foundation	449.00	
Salaries	750.00	
Subscriptions to Cotton Oil Press	254.00	
Accounts Receivable, April 30, 1924	30.39	
Cash on Hand, April 30, 1924	1,422.92	
		$4,431.71

The Society has on hand the following:

Cash	$1,422.92	
Liberty Bonds, Third Issue	200.00	
Fourth Issue	200.00	
Fuller's Earth, pounds	1036	
Moisture Dishes	3100	
Standard Salts, Bottles	4211	
The following are the Accounts Receivable on April 30, 1924:		
Armour & Co., New York	2.00	
Armour Fertilizer Works, Baltimore	3.00	
International Refining Co., San Antonio	2.44	
Lange Soap Co., San Antonio	1.15	
Magnolia Provision Co., Houston	.32	
Mutual Cotton & Oil Co., Phoenix	.87	
McKinney Steel Co., Cleveland	1.00	
Pacific Oil & Lead Works, San Francisco	1.59	
Portsmouth Cotton Oil Ref. Corp'n	12.67	
Southern Cotton Oil Co., New Orleans	3.20	
Southern Cotton Oil Co., Savannah	1.00	
Southport Mill, Ltd., New Orleans	1.15	

The membership of the Society on April 30, 1924 is 272, composed of 228 Active, 40 Corporation and 4 Honorary members.

Since last report, we have added 29 Active and 9 Corporation members, total added 38. Four Active members have been reinstated in addition to these. During the same period, we have lost 14 Active members by resignation and 22 by suspension for non-payment of dues; 2 Corporation members by resignation, and 4 by suspension for non-payment of dues; total members lost, 42. Our net loss for the year, therefore, is one member.

In submitting the above report, I earnestly request that an Auditing Committee be appointed to audit this report of the Secretary-Treasurer and report back to the Society before its adjournment on May 6, 1924.

LAW & CO. LABORATORIES,
WILMINGTON, N. C.

GOVERNING COMMITTEE REPORT

By H. B. Battle

The Governing Committee of the Society begs leave to make its annual report, as follows:

1. **Our Proposed Journal.**—It has heard and discussed very fully the report of the Committee on the Proposed JOURNAL of the Society, as presented by Editor H. S. Bailey. We unanimously recommend the adoption of this Committee's recommendation, with a few minor changes as shown below.

Proposals for Publishing an American Journal of Oils and Fats

It is proposed that the American Oil Chemists' Society publish a quarterly Journal to be known as THE JOURNAL OF OIL AND FAT INDUSTRIES under the following conditions:

1. Date of issue: Every three months beginning with July 1, 1924. The first two issues to compose Vol. I. The second volume to begin with January 1, 1925, and thereafter consist of four or more issues, as many as material and funds permit, each calendar year.

2. Make up of JOURNAL: The size of the pages to be $9^1/_4'' \times 6^1/_4''$. This is uniform with the *Journal of the A. C. S.* Each issue to be 32 pages exclusive of covers and advertising. The number of copies each issue to be 500, until the demand from increased subscriptions requires additional copies.

3. Subscriptions: (Honorary, Corporation and Active.) Every member of the American Oil Chemists' Society shall receive the JOURNAL as a part of his regular privileges as a member. Non-members shall be charged $2.50 per year, except for the first two issues, which form Vol. I, for which they shall pay only $1.00.

4. Exchange and Advertising Copies: The Editor shall be allowed copies of each issue to be used as exchanges for other scientific Journals. The managing editor, in charge of advertising, shall also be allowed as many copies as needed in securing advertisements.

5. Property Rights: The JOURNAL shall be the property of the American Oil Chemists' Society, and all papers published in it belong to the Society.

6. Management: The Editorial Staff of the JOURNAL shall consist of an editor, managing editor and six associate editors.

(*a*) The editor shall be responsible for the securing of material for each issue for its editorial make-up and the correction of proof.

(*b*) The managing editor shall have charge of all advertising.

(*c*) The associate editors shall aid in securing copy and have equal say with the editor on all questions of policy.

7. Printing and Mailing: The JOURNAL shall be printed and mailed by the *Eschenbach Printing Company* of Easton, Pa., in conformity with their agreement to cost as follows:

Composition, make-up, lock-up and make-ready per page.

Reading matter 8 point leaded	$3.55
New advertisements	5.25
Standing advertisements	.76
Paper, press work and binding per page per 100 copies	.10

The above per Harvey F. Mack's letter of February 8, 1924.

These figures total as follows per issue of 500 copies of 32 pages of articles and four of advertising, assuming an average cost of $1.00 per page for advertising:

32 × $3.55 =	$113.60 =	Regular articles.
4 × $1.00 =	$4.00 =	New and standing advertisements.
5 × $0.10 =	$18.00 =	Paper, binding, etc.

The above does not seem to include cost of cuts, headings, reprints and mailing, but the total would be less than $150.00 per issue or on the basis of a quarterly $600.00 per year.

We think it advisable to leave the selection of the Managing Editor and six associate editors to the Editor-in-Chief, Mr. Bailey, and he is requested to communicate with Mr. Fred H. Smith, of the Georgia Experiment Station, whom the Committee suggests for this office, and that full authority be given Mr. Bailey to secure his services on the best terms possible in the line of their report.

2. Elaboration of the Scope of the Society's Work.—We unanimously recommend that the scope of the work of our Society, as given in Article II of the Constitution as follows: "the promotion of the chemistry of fats, oils, waxes and allied industries," be more fully described in the following words: "To include all kinds of vegetable and animal fats and oils, and the products made therefrom, such as edible materials, soaps, and paints etc.," or in a more technical way, in the following words: "Saponifiable fats and oils, including vegetable and other edible oils, animal fats, and fish and marine animal oils, and all products made from them." This recommendation is not intended as a suggestion for a change or amendment to the Constitution or By-Laws, but merely an elaboration as expressing our understanding of the words in Article II given above.

Along with this elaboration, it would be within the power of the President to appoint such committees upon commercial fats, oils, soap, etc., as he may find desirable.

3. Conclusion.—We congratulate the Society upon the interest manifested by the various committees and members thereof, and by the members

of the Society in general. With such interest and enthusiasm now and in the future, the Society is bound to grow in numbers, enthusiasm and value to the fats, oils and wax industries, and consequently to our country at large.

Committee: H. B. BATTLE, Pres., H. J. MORRISON, P. P. HINDERLANG, J. R. MAYS, T. B. CALDWELL, L. M. TOLMAN, C. B. CLUFF, F. B. PORTER, R. W. PERRY.

SMALLEY FOUNDATION

Check Meal Samples for 1923-1924

By H. C. MOORE

The following tables give a concise summary of the coöperative analytical program for 1923–1924. A careful study of the tables is about all that is really necessary for this report, but a few comments will be added.

It is interesting to note that exactly 78 collaborators participated in each of the last two years. While a number who were enrolled in 1922–1923 dropped out, the same number of new collaborators were enrolled.

Table 1 shows the standing for the 36 collaborators who have determined oil in all of the samples. Last year 38 reported on the full series.

TABLE 1

STANDING FOR OIL RESULTS (30 Samples)

Place	Analyst no.	Total points off	Average error per sample	Efficiency per cent
1	74	34	0.0113	99.844
2	53	50	.0166	99.771
3	37	55	.0183	99.747
4 and 5	21	56	.0186	99.744
..	49	56	.0186	99.744
6	33	58	.0193	99.734
7 and 8	5	59	.0196	99.730
..	54	59	.0196	99.730
9	58	70	.0233	99.679
10	20	78	.0260	99.641
11	6	80	.0266	99.633
12	19	81	.0270	99.627
13	39	86	.0286	99.605
14	42	93	.0310	99.572
15	50	95	.0316	99.564
16	23	111	.0370	99.489
17	24	124	.0413	99.430
18	73	126	.0420	99.420
19	55	137	.0456	99.370
20	26	142	.0473	99.347
21	45	143	.0476	99.343
22	35	147	.0490	99.323
23	1	150	.0500	99.310
24	76	159	.0530	99.270

25	51	160	.0533	99.264
26	4	180	.0600	99.171
27	43	181	.0603	99.164
28 and 29	46	205	.0683	99.057
..	72	205	.0683	99.057
30	40	206	.0686	99.052
31	3	207	.0690	99.047
32	62	253	.0843	98.836
33	25	304	.1013	98.601
34	64	443	.1476	97.961
35	7	466	.1553	97.855
36	68	640	.2133	97.054

Table 2 shows the corresponding standing for the 50 collaborators who reported ammonia determinations on all of the samples. Last year 56 reported ammonia results on the entire series.

TABLE 2

STANDING FOR AMMONIA RESULTS (30 Samples)

Place	Analyst no.	Total points on	Average error per sample	Efficiency per cent
1	12	5	0.0017	99.979
2 and 3	21	19	.0063	99.923
..	66	19	.0063	99.923
4 and 5	23	21	.0070	99.915
..	74	21	.0070	99.915
6	11	22	.0073	99.911
7	72	25	.0083	99.899
8	43	26	.0086	99.895
9	37	30	.0100	99.878
10 and 11	24	33	.0110	99.866
..	26	33	.0110	99.866
12	58	36	.0120	99.854
13	20	37	.0123	99.850
14	50	38	.0126	99.846
15	1	42	.0140	99.830
16	35	43	.0143	99.826
17	6	45	.0150	99.817
18	33	47	.0156	99.810
19, 20	5	50	.0166	99.798
21 and 22	16	50	.0166	99.798
..	49	50	.0166	99.798
..	53	50	.0166	99.798
23	48	53	.0176	99.785
24	62	54	.0180	99.780
25 and 26	19	55	.0183	99.777
..	27	55	.0183	99.777
27	38	57	.0190	99.769
28	54	58	.0193	99.765
29	40	60	.0200	99.756
30	3	62	.0206	99.749
31	4	63	.0210	99.744

TABLE 2 (*Concluded*)

Place	Analyst no.	Total points off	Average error per sample	Efficiency per cent
32 and 33	10	64	.0213	99.740
..	42	64	.0213	99.740
34, 35	25	73	.0243	99.704
and 36	32	73	.0243	99.704
..	45	73	.0243	99.704
37	44	74	.0246	99.700
38 and 39	51	76	.0253	99.691
..	76	76	.0253	99.691
40	7	81	.0270	99.671
41	73	112	.0373	99.545
42	28	115	.0383	99.533
43	55	123	.0410	99.500
44	39	126	.0420	99.488
45	46	130	.0433	99.472
46	29	131	.0436	99.468
47	34	151	.0503	99.387
48	68	169	.0563	99.313
49	64	174	.0580	99.293
50	69	182	.0606	99.261

Table 3 shows the laboratory standing for both oil and ammonia results for the 36 collaborators who completed all determinations as compared with 38 who reported on all the samples last year.

TABLE 3

LABORATORY STANDING FOR BOTH OIL AND AMMONIA RESULTS (30 Samples)

Place	Analyst no.	Efficiency per cent
1	74	99.880
2	21	99.834
3	37	99.813
4	53	99.785
5	33	99.772
6	49	99.771
7	58	99.767
8	5	99.764
9	54	99.748
10	20	99.746
11	6	99.725
12	50	99.705
13 and 14	19	99.702
..	23	99.702
15	42	99.656
16	24	99.648
17	26	99.607
18	35	99.575
19	1	99.570
20	39	99.547
21	43	99.530

22	45	99.524
23	73	99.483
24	76	99.481
25 and 26	51	99.478
..	72	99.478
27	4	99.458
28	55	99.435
29	40	99.404
30	3	99.398
31	62	99.308
32	46	99.265
33	25	99.153
34	7	98.763
35	64	98.627
36	68	98.184

TABLE 4

RESULTS OF OTHER COLLABORATORS WHO FAILED TO REPORT ON ALL SAMPLES, OR WHOSE RESULTS WERE RECEIVED TOO LATE TO ACCEPT

Analyst no.	Number reported	Total points off	
		Oil	Ammonia
2	27	233	42
8	28	102	61
9	29	118	..
9	28	...	85
13	28	...	77
14	29	...	168
15	29	...	87
17	27	...	57
18	29	...	72
22	22	129	70
30	29	...	210
31	30	...	23*
36	30	932	287**
41	29	...	93
47	29	474	86
52	27	92	76
56	29	201	65
57	22	56	55
59	28	...	195
60	15	...	21
61	29	289	160
63	28	...	25
65	29	128	44
67	30	205	63**
70	23	107	54
71	28	85	77
75	21	...	79
77	29	...	76
78	16	50	29

* Reported on all, but results on one sample not received in time to accept.
** Reported on all, but results on two samples not received in time to accept.

Several who reported on all of the samples for both oil and ammonia last year, but whose results were received too late to be included in the official standing, were included in the tabulation given, with notes to this effect. This year, however, those whose results were received too late are reported in Table 4. Three of this number reported on all 30 samples, but their results were received too late.

It might be stated in this connection that the Chairman has been as liberal as he dared in accepting late reports. The rules have provided that only those reports received on Monday could be accepted. In many cases, however, reports have come in on Tuesday, and these results have been accepted, as have also some others which have been mailed on time and been lost in the mails, but which were received by the Chairman prior to the time when the mailed reports could have reached the collaborators. In the case of the last two samples, which were reported together, there was some misunderstanding; some forgot to report on No. 30 along with No. 29. All results in the case of these two samples have been accepted where they showed evidence of being mailed by the collaborators prior to the time when they could have received the printed report. The rules have thus been stretched just as far as it has seemed advisable, and it is hoped that the interpretation thereof will meet with the approval of all.

Many of the collaborators have been disappointed on several occasions that their results were received too late for acceptance, which may have caused them to lose some interest early in the series, but all have had the privilege of availing themselves of the Chairman's offer to wire any collaborator, collect, in case the results are not received on time. There have been many instances of failure of the mails to bring in reports, even though mailed in ample time. If a collaborator wishes to insure receipt of his results on all the samples, it is advisable to take advantage of this service.

The prize awards for the best work done on these samples as published in the August, 1923 number of the *Cotton Oil Press*, are as follows:

Grand Prize Award

"A laboratory cup will be awarded to the collaborator having the highest average standing both for oil and ammonia for the entire series of thirty samples."

Certificates of Merit

"In addition to the cup, the following certificates will be awarded:

"One certificate to the collaborator having the second highest average standing for both oil and ammonia for the entire series of thirty samples.

"Two certificates to the collaborators having the highest average standing in the oil work for the entire series of thirty samples.

"Two certificates to the collaborators having the highest average standing in the ammonia work for the entire series of thirty samples."

The winners of these prize awards are as follows:

The laboratory cup for the highest average for both oil and ammonia is awarded to L. B. Forbes, of Memphis, Tenn., Analyst No. 74, whose per cent efficiency is 99.880.

The certificate for second place is awarded to Barrow-Agee Laboratory, of Shreveport, La., Analyst No. 21, whose per cent efficiency is 99.834.

The certificates for the highest averages for the ammonia results are awarded to:

W. R. Austin, of Nashville, Tenn., Analyst No. 12, whose per cent efficiency is 99.979.

Barrow-Agee Laboratory of Shreveport, La., Analyst 21, and Stillwell Laboratories, of New York, Analyst No. 66, who have tied for second place with a per cent efficiency of 99.923.

Certificates for the highest averages for the oil results are awarded to:

L. B. Forbes, of Memphis, Tenn., Analyst No. 74, whose per cent efficiency is 99.844.

G. C. Hulbert, of Augusta, Ga., Analyst No. 53, whose per cent efficiency is 99.771.

In accordance with the resolution adopted at the last meeting, it was decided that each collaborator should be assigned a number, and that his identity should not be known except in the case of those who won the awards.

The method for determining the standing of the various collaborators and their per cent efficiency was the same method as used last year, as follows:

All results within 0.02% of the accepted average have been counted as 100% or "no points off." The total number of points off for any collaborator for either oil or ammonia, divided by thirty, gives the average error per sample, and this average error, in the case of oil, divided by 7.24 (the average of the accepted oil averages is 7.237) and divided by 8.20 for ammonia (the average of the accepted averages being 8.197) gives the average percentage error. This subtracted from 100 gives the per cent efficiency. Thus in the case of Table 1, L. B. Forbes has an average error of 0.0113 for oil. This, divided by 7.24, equals 0.156% error, or 99.844% efficient.

It was remarked in the Chairman's last report that "it hardly seems likely that the standard set by the leaders in the oil and ammonia work can soon be surpassed." It will be observed that a new record has been established by the leader in the ammonia series. The other results for oil and ammonia this year would also average slightly lower in efficiency than those of last year. This difference however is but slight, and may possibly be explained by the fact that last year one or two samples were thrown out on account of a number of wide results and indications of lack of uniformity

of the samples. It was decided at the meeting last year that no samples would hereafter be discarded.

Judging from the comments of the collaborators, the samples this year, with the possible exception of No. 25, have been generally very uniform. A number of collaborators expressed the belief that this sample was not uniform. This was confirmed later by several of the collaborators who exchanged samples with each other and found quite different results than on their own samples. There has been very little cause, however, for criticism of the samples, which have been generally very satisfactory.

There have been more instances this year of collaborators failing to receive samples on time. This has kept several who otherwise would have reported on all 30 samples from being included in the final reports. This is partly, however, the fault of the collaborators in failing to notify Mr. Bailey in time to have another sample mailed.

Only about half of the collaborators responded to the Chairman's request published on report No. 30 that they figure up their number of points off on each sample and advise the Chairman of their findings. The Chairman has not double-checked the results except those who have earned certificates. It would seem that in view of the time required by a Chairman of any of our active committees in the conduct of work of this kind that the collaborators might reply to requests of this kind, which indicates a willingness to coöperate, and will make the work much more enjoyable to all.

Two members of the Ammonia Committee have suggested that check samples be continued throughout the year, but that they be not sent so often during the summer months. The Chairman does not concur in this recommendation, and does not believe that the Society will, for many obvious reasons.

The Ammonia Committee during the past year has undertaken no additional research or study of methods, and has nothing in addition to report.

Committee: H. C. MOORE (Armour Fert. Works, Chicago), L. B. FORBES, C. A. BUTT, JOHN MALOWAN, C. H. COX.

SOAP STOCK COMMITTEE REPORT 1923-24

BY A. A. ROBINSON

The committee this year divided its work into three sections:

First was a continuation of the work begun by last year's committee on the F. A. C. Committee (American Chemical Society) method for unsaponifiable as applied to soap stock.

Second, it tried out two methods, or rather two modifications of one method for Free Oil in soap stock.

Third, two proposed changes in the official method for total fatty acids

were investigated. These changes consisted in (*a*) Drying the fatty acids under an inert gas such as carbon dioxide, and (*b*) Baking the saponified mass, just after the alcohol is driven off, at 120°C. for two hours. This latter was suggested by an article by Dr. Steipel in *Zeit d. Ol u Fett Ind.*, vol. 41, 1921, in which he stated that this is necessary to get rid of certain alkali-combining, resin-like oxy fatty acids, which would otherwise be determined as fatty acids. These substances are not only worthless as soap, themselves, it being impossible to salt them out, but they also render an equal quantity of soap of fatty acids incapable of being salted out.

SAMPLE NO. 1 CORN OIL SOAP STOCK

	Unsaponifiable matter	% Free oil		Official method		Total fatty acids Drying under CO_2		Baking at 120°C.		T. F. A. by separatory funnel method
	%	KOH	NaCl	%	I No.	%	I No.	%	I No.	
Moore	4.49	15.13	16.39	50.83	...	51.09	...	50.92	...	...
Long	4.98	14.90	16.77	51.27	...	51.53	...	51.80	...	51.39
Reese	5.00	14.51	15.81	51.91[a]	...	50.58[a,b]	...	52.31[a]	...	...
Tompkins	4.62	15.14	15.19	51.90	...	51.92	...	52.03	...	...
Irwin	5.00	14.90	15.40	51.13	...	50.98	...	51.10	...	...
Robinson	4.87	15.00	15.35	51.60	...	51.41	...	51.34	...	...

SAMPLE NO. 2 SOYA BEAN OIL SOAP STOCK

Long	1.40	7.42	7.72	37.98	...	37.47	...	37.61	...	37.80
Tompkins	1.08	9.35	9.15	39.25	121.0	39.08	131.0	38.95	121.0	...
Reese	1.71	8.35	8.03	40.06	70.5	37.83	121.0	38.77	94.5	...
Bosart	2.13	8.59	7.80	39.80	134.6	39.80	135.1	39.50	127.8	...
Irwin	1.34	8.05	8.11	37.30	128.8	37.30	130.4	37.10	121.0	...
Strack	1.32	8.96	8.29	37.93	123.3	38.02	127.9	37.91	127.0	...
Robinson	1.14	7.72	7.79	37.87	...	37.65	...	37.81	...	...

[a] Wet extraction method used.

[b] Dried under natural gas.

Unsaponifiable Matter

The results on unsaponifiable matter obtained on the sample of corn oil soap stock showed fairly close agreement. Those obtained on the Soya Bean Soap stock were not as good. However, the F. A. C. Method has for years proven so successful on Fats of all kinds, that your committee believes that it will be satisfactory for soap stocks. The method is simple, fairly rapid and gives concordant results in the hands of different analysts. Your committee recommends that it be made official for soap stocks. The F. A. C. Method for unsaponifiable matter is as follows:[1]

Determination

"Weigh 5 g. (±0.20) of the prepared sample into a 200cc. Erlenmeyer flask, add 30 cc. of redistilled 95% Formula 30 alcohol and 5 cc. of 50% aqueous potassium hydroxide and boil the mixture for one hour under a reflux condenser. Transfer to the extraction cylinder and wash to the

[1] *J. I. E. C.*, **11**, 1164 (1919).

40cc. mark with redistilled 95% ethyl alcohol. Complete the transfer, first with warm then with cold water, till the total volume amounts to 80 cc. Cool the cylinder and contents to room temperature and add 50 cc. of petroleum ether. Shake *vigorously* for one minute and allow to settle until both layers are clear, when the volume of the upper layer should be about 40 cc. Draw off the petroleum ether layer as closely as possible by means of a slender glass siphon into a separatory funnel of 500cc. capacity. Repeat extraction at least four more times using 50 cc. of petroleum ether each time. Wash the combined extracts in a separatory funnel three times with 25cc. portions of 10% alcohol, shaking vigorously each time. Transfer the petroleum ether extract to a wide-mouth tared flask or beaker and evaporate the petroleum ether on a steam-bath in an air current. Dry as in the method for moisture and volatile matter. Any blank must be deducted from the weight before calculating unsaponifiable matter. Filter and wash free from the insoluble residue, if any, evaporate and dry in the same manner as before. The committee wishes to emphasize the necessity of thorough and vigorous shaking in order to secure accurate results. The two phases must be brought into the most intimate contact possible, otherwise low and disagreeing results may be obtained. When the unsaponifiable matter runs over 5%, more extractions are recommended."

Free Oil

The method for free oil investigated was one which was tried out by the committee for 1920–21. It is as follows:

"A," weigh 10 gm. of the well mixed sample into an extraction cylinder. Dissolve in 80 cc. of 50% alcohol, made up from redistilled alcohol. Add 50 cc. of petroleum ether, boiling below 65°C. Shake thoroughly, then add 10 cc. of 14% solution of potassium hydroxide and shake vigorously for one minute. Allow to settle until both layers are clear, draw off the petroleum ether layer as closely as possible with a glass siphon, into a 500cc. separatory funnel. Repeat the extraction at least four times, using 50 cc. petroleum ether each time.

Wash the combined extracts in the separatory funnel three times with 25cc. portions of 10% alcohol, shaking vigorously each time. Transfer the petroleum ether extract to a tared soxhlet flask, and evaporate the petroleum ether on the steam-bath. Dry in oven at 105°C. to constant weight. This weight includes neutral glyceride and unsaponifiable matter. The latter is subtracted, giving the weight of neutral oil.

"B," the same as above except that 10 cc. of sodium chloride is used in place of the 10 cc. of 14% potassium hydroxide. In this case, the dried oil is dissolved in a little petroleum ether, an equal volume of neutral alcohol added and the free fatty acids present titrated with 0.1*N* alkali,

using phenolphthalein as an indicator. The amount found is deducted from the weight of neutral oil, free fatty acids and unsaponifiable matter.

This method "B" was found to be unsatisfactory due to the difficulty of getting two clear layers when extracting with petroleum ether. Practically all the collaborators reported that they had trouble in getting check results by this method.

Method, "A," seems to offer possibilities of being satisfactory. The results obtained were fairly close, and not much difficulty was experienced in making the determination. However, the question arises as to whether or not the 14% potassium hydroxide used caused a loss of neutral glyceride by saponification. Your committee does not believe it advisable to recommend the adoption of this method until that point has been investigated.

Total Fatty Acids

An examination of the results obtained on the total fatty acid determinations, shows clearly that there is no value to either of the proposed modifications. No lower results were obtained when the fatty acids were dried under CO_2, and the iodine absorption value of the fatty acids was not materially changed. This confirms the results obtained a few years ago, when it was found that it was not necessary to dry the fatty acids from crude cottonseed oil in an inert atmosphere, due to the protective action of certain impurities present.

Baking the soap mass at 120° for two hours was without effect on the amount of total fatty acids determined.

In the course of the year's work a matter, which the committee had not considered, was brought to its attention. That is the substitution of a wet extraction method for total fatty acids other than cocoanut and palm kernel. The method now official is slow and for that reason is not used by many laboratories in cases not involving settlement. In addition, on soap stocks from the more liquid oils, such as soya bean, corn and linseed, the present official method can be followed only with the greatest difficulty. A chilled work room is necessary if the fatty acids are to be solidified and kept so until the filter paper is dry.

Enough experimental work has been done in the past to prove beyond a doubt that a wet extraction method is capable of as great accuracy as the present method. This was brought out by the report of the committee for 1920–21, at which time Mr. Long was chairman. However, as additional data, in the present report, Mr. Long has shown the results obtained by a wet extraction method, while all of Mr. Reese's results were obtained by wet extraction.

In view of this, the committee wishes strongly to urge the adoption of a wet extraction method for total fatty acids in the place of, or, at any rate, in addition to the method now official.

The method that it proposes for adoption is as follows:

Total fatty acids.

NOTE: Excepting Copra and Palm Kernel Soap Stock.

Weigh out from weighing bottle 8 or 10 grams of the well mixed sample of soap stock, or 4 to 5 grams of acidulated soap stock, and transfer to a 400cc. beaker. Saponify with a excess of alcoholic potassium hydroxide. After saponification is complete heat on a steam-bath, with stirring until all the alcohol is driven off.

When the alcohol is evaporated, add 100 cc. of water and heat until the soap is dissolved. Wash the contents of the beaker into an extraction cylinder (a 250cc. glass stoppered cylinder) with hot water taking care not to exceed 130 cc. total volume in the cylinder. Acidify with dilute hydrochloric acid (1:1), carefully avoiding too large an excess. Mix gently by rotating the cylinder. When the cylinder has cooled to 50°C. add 100–125 cc. redistilled petroleum ether boiling below 65°C. It is not necessary for the fatty acids to have cleared thoroughly. Stopper cylinder and shake, then allow to stand until the petroleum ether layer has separated. Siphon off this petroleum ether layer through a 9 cm. filter paper to a 400cc. beaker. Make at least four more extractions using 25–30 cc. of petroleum for each extraction. Allow filter paper to drain well, then wash with a spray of petroleum ether from a wash bottle, until all the fatty acids are extracted. Add all the petroleum ether extractions to the first extraction in the 400cc. beaker. Evaporate partially and transfer to a tared 150cc. Soxhlet flask on the steam-bath, washing all traces of the fatty acids from the beaker with petroleum ether from a wash bottle. Evaporate all petroleum ether and heat in oven at 105°C. to constant weight. Report as per cent, "total fatty acids."

This is essentially the same method as is now official for cocoanut soap stock and should give equally satisfactory results.

Summary

1. The committee recommends that the F. A. C. Method for unsaponifiable matter be made official for soap stocks.

2. The committee does not recommend any method for free oil in soap stocks. However, it found the method, "A," as described above, to give promise and advises that work on it be continued in the future.

3. Drying the total fatty acids under CO_2 is not necessary, even with such easily oxidized fatty acids as those from corn and soya bean oils.

4. Baking the saponified mass at 120°C. is not necessary.

5. The committee recommends that a wet extraction method for total fatty acids in cottonseed and other soap stocks be made official.

The committee wishes to express its appreciation of the valuable colla-

boration given it by Mr. Irwin, of Swift & Co., Dr. Bosart of Procter & Gamble and Mr. Strack of the Southern Cotton Oil Co.

Committee: A. A. ROBINSON, Wilson & Co., Chicago Ill., C. P. LONG, W. J. REESE, G. A. MOORE and P. W. TOMPKINS

COLOR OF OIL AND MEAL COMMITTEE REPORT

BY DAVID WESSON

During the past year the chief efforts of the Committee have been to find out by means of comparative work whether the Eastman colorimeter can be made to supersede the Lovibond glasses and the type of tintometer now being used with artificial light.

Along in December, Mr. Morrison was requested to send several samples obtained from coöperative work to several laboratories which possessed Eastman colorimeters. The plan was for each laboratory to read the samples and then send them to the next laboratory, so that all the readings might be made on the same identical samples. Instructions were sent out to read the samples at the same time with the Lovibond glasses and report them. Owing to various causes the samples started on their rounds in December, did not reach the Chairman of this Committee until some time in March. The following tabulation of results shows big differences between different laboratories whether they work with the Lovibond glasses or with the Eastman colorimeter:

Description of sample	Lovibond reading Lovibond marked Red	Lovibond reading Lovibond found Red	Eastman readings Red	Eastman readings Yellow	Eastman readings Neutral
Analyst 2, P. and G. Dallas Oil No. 3					
P. and G.	16	15	41	50	36
Armour and Co.	..	14	48.9	50	35.1
Southern Cotton Oil, Savannah	..	..	39.4	50	35.6
Wesson, New York	..	13.3	38.8	50	29.3
Analyst 4, Tilson Lab. Houston Oil No. 3					
P. and G.	16	16.2	42	50	33
Armour and Co.	..	13.6	49.3	50	35.3
S. C. O. Co., Savannah	..	..	39.8	50	34.8
Wesson, New York	..	13.5	39	50	28
Analyst 27, Swift and Co., Chicago 14° Lye, Oil No. 3					
P. and G.	14.2	16.8	41	50	36
Armour and Co.	..	13.6	48	50	34.6
S. C. O. Co., Savannah	..	..	38.6	50	34.4
Wesson, New York	..	13.3	39.4	50	28

Description of sample	Lovibond reading Lovibond marked Red	Lovibond reading Lovibond found Red	Eastman readings Red	Eastman readings Yellow	Eastman readings Neutral
Analyst No. 27, Swift and Co. 16° Lye, Oil No. 3					
P. and G.	14.7	14.5	39.6	50	34
Armour and Co.	..	13.4	48	50	34.7
S. C. O. Co., Savannah	..	..	38.4	50	33.6
Wesson, N. Y.	..	13.1	37	50	28
Analyst No. 27, Swift and Co. 18° Lye, Oil No. 3					
Procter and Gamble	15.2	15.7	38.7	50	34
Armour and Co.	..	13.3	46.3	50	33.5
S. C. O. Co., Savannah	..	..	38.4	50	33.6
Wesson, N. Y.	..	13.1	38	50	28.5
Analyst No. 27, Swift and Co. 18° Lye, Oil No. 3					
Procter and Gamble	13.5	14.3	39.3	50	35
Armour and Co.	..	13.6	47.7	50	33.2
S. C. O. Co., Savannah	..	..	38	50	35
Wesson	..	13.3	38	50	28

It was felt that no safe conclusions could be drawn on account of the length of time required for the samples to make their rounds. Accordingly, four samples were made up, marked A, B, C and D, and sent out to four different observers with the request that they be read as soon as possible and reports made. The Chairman after reading his samples secured the coöperation of Mr. Buel, of the Corn Products Refining Company, at Edgewater, N. J., who also read the samples. The tabulated results show big discrepancies in color readings between different laboratories no matter which instruments they used.

This is due beyond question to the inherent difficulty arising from the differences existing in different human eyes. In some of the samples it will be noticed that quite close readings have been obtained by different observers. In other samples the readings are very diverse. It is believed that in many cases the difficulty arises from inability of the human eye to distinguish between certain shades of orange and yellow. In other words, varying proportions of yellow and red will look alike to many eyes.

One difficulty found with some observers was that they did not use the same tubes. It makes some difference whether the oil is looked at through a precision tube or through a four ounce bottle which has had the neck cut off, or again whether the sample is contained in a Nessler tube with a very thin bottom. In order to find out the effect of the tube, different observers were requested to balance up the field of the Eastman colorimeter and then make the readings on the empty tubes.

It will be noticed that in looking at these readings there is a difference in the results obtained by the different observers, indicating that either

the tubes vary or there is a difference in balancing up the field. The color due to the tubes should, of course, be subtracted from the final readings to get the true color of the samples reported on.

Particular attention is called to the results on Sample A. Some of the observers reported they could not match it and others gave the readings which seemed to be nearest within the capacity of the instrument. There is no question but the sample is off the scale of the instrument on the red. Considerable difficulty seems to have been obtained in getting agreements on sample of white oil.

The Chairman of this committee does not like to give up the matter of getting concordant results between different laboratories and intends to try the matter out more fully. It is felt, however, that if close agreement on color matching is desired, that we should have some instrument which will give the results regardless of observers' ability to distinguish colors. The only instrument which seems to be practical for this purpose is the Keuffel and Esser spectrophotometer. This instrument is expensive but it will give results with a high precision. The question naturally arises "is a high precision necessary or desirable in our work?" If different eyes cannot distinguish carefully within several degrees of color, what is the necessity for having such close color limits. Oil is made for the purpose of eating. A few points of color one way or another on the Lovibond scale has no effect on its digestibility or nutritive value. It would seem to be practicable that for trading purposes definite grades of oil should be carried in a classification which should have quite elastic limits. In other words, in using the Lovibond glasses, it seems to the writer unnecessary to read closer than 0.2 of a point red because there is apt to be more than that difference between different eyes and also between different sets of glasses. Since the Lovibond instrument was first adopted, the entire practice of the trade has undergone many changes. Something like 80% or more of the oil is used in lard substitutes and the refiner does not care so much what the color of yellow may be so long as it can be bleached to a definite color white oil.

The suggestion is, therefore, made that consideration should be given to a plan of basing color of given samples on the color of the white oil it will make when bleached under definite conditions. It is believed in this way that much more satisfactory results can be obtained, especially when comparing different crude oils, than we obtain now by simply going on the color of the yellow oil.

Mr. Herbert S. Bailey, of Savannah, has designed a very neat addition to the tintometer which we are now using, which enables one to handle the glasses with a minimum of effort by merely turning milled heads. His instrument has been passed on by Dr. Priest, of Washington, and your chairman, and pronounced a very practical arrangement for our use. It possesses all the advantages of our standard tintometer together with

those of more expensive instruments. Furthermore, Dr. Priest has assured us that next year it will be possible for the Bureau of Standards to standardize Lovibond glasses for a nominal fee.

The chairman recommends the continuation of our present instrument, the Greiner tintometer, using Lovibond glasses with or without the Bailey modification, which will be shown at the meeting.

The readings obtained on samples A, B, C and D, by different observers using both Lovibond glasses and Eastman colorimeter are shown in the following tables:

	Lovibond reading		E. K. reading		
	Y	R	A	B	C
Sample A					
Allen	35	48	Not sufficient red on instrument		
Buel	65	35	Too dark to match		
Morrison	35, 50	54, 53	100	50	39.3
Vollertsen	55	56	Not sufficient red on instrument		
Wesson	35	50	100+	50	41
Sample B					
Allen	35	7.2	17.6	50	16.1
Buel	35	6.6	18.0	50	12.9
Morrison	35	5.5	18.5	50	18.2
Vollertsen	35	6.0	25.6	50	11.7
Wesson	35	7.0	18.5	50	18.2
Sample C using 50 Yellow					
Allen	35	5.4	14.2	50	16.1
Buel	35	4.9	14.3	50	12.5
Morrison	35	5.1	13.3	50	9.5
Vollertsen	35	4.3	21.9	50	11.8
Wesson	35	5.0	14.1	50	17.0
Sample C, no Restriction					
Allen	35	5.4	13.7	46.0	18.5
Buel	35	4.9	..	..	..
Morrison	35	5.1	16.2	40.0	13.3
Vollertsen	35	4.3	19.3	69.2	10.4
Wesson	35	5.0	..	..	..
Sample D					
Allen	18	1.8	4.9	25.7	19.3
Buel	15	1.7	1.1	50.0	12.5
Morrison	18	1.8	4.9	25.7	19.3
Vollertsen	15	1.5	8.3	31.8	11.7
Wesson	20	2.1	0.0	50.0	18.0

(All results with the E. K. instrument are the average of five different readings.)

	Reading of tube
Allen	13.0 C
Buel	9.4 C
Morrison	2.0 C
Vollertsen	7.5 C
Wesson	15.0 C

Mr. Buel, of the Corn Products Refining Company, has sent me readings made by three different members of his laboratory on samples B, C and D. He has not only figured the ratio of error but he has adopted the expedient of adding together the total number of color points in each case, with apparently fairly close results except on sample D which was a white oil. This work shows the amount of error which may be expected in the use of the Eastman instrument by different people.

RESULTS OF OPERATOR X ON PRECISION TUBE

	Sample B				Sample C				Sample D			
	A	B	C	Total	A	B	C	Total	A	B	C	Total
	19.0	50	12.4	81.4	14.6	50	12.2	76.8	1.3	50	12.1	63.4
	17.8	50	14.0	81.8	13.8	50	13.0	76.8	1.1	50	13.0	64.1
	17.8	50	12.2	80.0	14.0	50	12.2	76.2	1.4	50	12.6	64.0
	17.2	50	13.8	81.0	14.4	50	12.7	77.1	1.2	50	11.6	62.8
	19.2	50	12.0	81.2	14.7	50	12.5	77.2	0.5	50	13.0	63.5
Average	18.2	50	12.9	81.1	14.3	50	12.5	76.8	1.1	50	12.5	63.6
Individual ratio of error				2.2				1.7				1.9

RESULTS OF OPERATOR Y ON PRECISION TUBE

	Sample B				Sample C				Sample D			
	A	B	C	Total	A	B	C	Total	A	B	C	Total
	17.8	50	14.2	82.0	15.6	50	11.6	77.2	...	50	11.7	61.7
	17.2	50	14.6	81.8	15.3	50	12.5	77.8	...	50	11.9	61.9
	17.4	50	14.6	82.0	14.5	50	12.3	76.8	...	50	11.6	61.6
	17.4	50	13.1	80.5	14.3	50	11.4	75.7	0.6	50	12.2	62.8
	17.8	50	12.6	80.4	14.0	50	12.4	76.4	...	50	11.2	61.2
Average	17.5	50	13.8	81.3	14.7	50	12.0	76.7	0.1	50	11.7	61.8
Individual ratio of error				1.9				2.7				2.6

RESULTS OF OPERATOR Z ON PRECISION TUBE

	21.6	50	12.7	84.3	16.0	50	12.6	78.6	1.6	50	13.7	65.3
	19.7	50	12.8	82.5	15.0	50	14.0	79.0	...	50	16.0	66.0
	20.7	50	13.8	84.5	14.4	50	13.4	77.8	...	50	15.0	65.0
	19.9	50	14.0	83.9	13.8	50	14.2	78.0	...	50	13.8	63.8
	19.6	50	14.0	83.6	15.0	50	13.4	78.4	1.0	50	14.6	65.1
Average	20.3	50	13.5	83.8	14.8	50	13.5	78.3	0.5	50	14.6	65.1
Individual ratio of error				2.4				1.5				3.3
Group ratio of error maximum				5.1				4.2				8.3
Group ratio of error average				3.2				2.0				5.1

RESULTS OF OPERATOR X ON PLAIN TUBE

	Sample B				Sample C				Sample D			
	A	B	C	Total	A	B	C	Total	A	B	C	Total
	16.6	50	11.5	78.1	13.8	50	9.3	73.1	...	50	10.8	60.8
	17.6	50	11.2	78.8	13.7	50	10.0	73.7	...	50	11.0	61.0
	17.2	50	11.4	78.6	13.5	50	9.3	72.8	...	50	11.7	61.7
	16.9	50	11.2	78.1	14.0	50	10.2	74.2	...	50	11.2	61.2
	17.3	50	11.6	78.9	14.0	50	9.4	73.2	...	50	12.5	62.5
Average	17.1	50	11.4	78.5	13.8	50	9.6	73.4	...	50	11.4	61.4
Individual ratio of error				0.9				1.9				2.7

RESULTS OF OPERATOR Y ON PLAIN TUBE

	Sample B				Sample C				Sample D			
	A	B	C	Total	A	B	C	Total	A	B	C	Total
	18.6	50	10.7	79.3	14.4	50	8.9	74.3	...	50	12.0	62.0
	19.0	50	10.0	79.0	12.0	50	11.0	73.0	...	50	10.4	60.0
	19.2	50	9.8	79.0	14.5	50	7.9	72.4	...	50	12.2	62.2
	18.7	50	10.4	79.1	15.2	50	8.4	73.6	...	50	14.4	64.4
	19.1	50	10.0	79.1	14.8	50	9.7	74.5	...	50	11.9	61.9
Average	18.9	50	10.2	79.1	14.2	50	9.2	73.4	...	50	12.2	62.2
Individual ratio of error				0.4				2.8				4.7

RESULTS OF OPERATOR Z ON PLAIN TUBE

	16.8	50	10.1	76.9	11.2	50	10.6	71.8	0.8	50	7.6	58.4
	17.7	50	11.8	79.5	12.4	50	8.6	71.0	...	50	10.6	60.6
	17.9	50	11.4	79.3	13.2	50	9.0	72.2	0.4	50	19.2	59.6
	18.0	50	12.4	80.4	14.2	50	9.2	73.4	0.4	50	9.7	60.1
	17.4	50	12.0	79.4	11.8	50	9.3	71.1	1.0	50	9.7	60.7
Average	17.8	50	11.5	79.3	12.6	50	9.3	71.9	0.5	50	9.4	59.9
Individual ratio of error				4.4				3.3				3.7
Group ratio of error maximum				4.4				4.7				9.3
Group ratio of error average				1.0				2.0				3.7

All color readings shown above were made on a 5″ column of oil.
Computed to a $5\frac{1}{4}$″ column, the total colors of these three oils would be as follows:

B	C	D
83.2	76.5	64.2

BLANK READING ON TUBES RECEIVED FROM DR. WESSON

	Plain tubes						
	1	2	3	4	5	6	Precision
	5.0	4.4	3.8	3.2	4.0	5.3	9.1
	4.1	3.5	4.7	4.1	3.4	5.3	9.2
	3.7	3.2	4.9	3.4	4.0	4.7	9.3
	4.2	4.6	3.4	4.8	5.1	4.8	9.7
	4.4	3.0	4.7	3.6	4.0	6.4	9.8
Average	4.3	4.1	4.3	3.8	4.1	5.3	9.4

Greiner Tintometer

To those not familiar with the Greiner tintometer, the instrument consists of a black box $16\frac{1}{4}$″ long, $4\frac{1}{4}$″ wide, and 10″ high. It is mounted on a black wooden base and hinged to this base. Light is obtained from a 150-watt daylight globe located at the top of the rear end on the inside. This light is reflected by means of a magnesia block up two glass tubes in the front end of the box. In one of these tubes is the oil under examination, and over the other Lovibond color glasses used in matching the color of the oil. The color of the oil and the Lovibond glasses are viewed through a tube extending above them and having a small aperture at its extreme upper end.

The advantages of this instrument over the old type of tintometer, using

daylight, consists of a constant source of light which is independent of weather conditions, and time of day, and a tube which allows a more careful measurement of the column of oil.

While personally, I have made no comparison of the color of oil read with this instrument and the old type, the results I have seen indicate that the Greiner tintometer readings are lighter than those obtained with the daylight type.

The following are some suggested changes which would improve the instrument:

The inside of the metal tubes through which the oil and glasses are observed should be coated with a non-reflecting black paint to remove reflected light.

Have the tubes in which the sample is held slightly longer so as to facilitate removal of tube from instrument.

Have the tubes marked at $5^1/_4''$ all around for ease in determining height of oil column.

Have an eye piece to cut out side lights.

Have a source of standard glasses so as to eliminate variations in glasses.

Committee: DAVID WESSON (120 Broadway, N. Y. City), H. P. TREVITHICK, A. W. PUTLAND, E. M. JAMES, J. F. LAYER.

BASIC RESEARCH COMMITTEE WORK

BY DAVID WESSON

Most of the work in this connection has been done in the Oil Fat and Wax Laboratory and the Protein Investigation Laboratory of the Bureau of Chemistry.

A visit to the Bureau of Chemistry on January 29th showed that Dr. Jamieson was engaged in the examination of the organic phosphorous compounds which occur in crude cottonseed oil. He has now found that the oil contains a small amount of plant lecithin in addition to the inosite phosphate previously reported. It should be observed that the plant lecithins differ in composition from the egg and other animal lecithins in that they (the former) contain a carbohydrate (glucose or galactose) group. From the present investigation it is apparent that the larger part of the phosphorus present in the oil exists in the form of plant lecithin or similar compound. He has extracted from the crude oil by means of methyl alcohol a phosphatide whose cadmium chloride salt is soluble in ether. The corresponding salt of egg lecithin on the other hand is entirely insoluble in ether. It is possible that he has isolated a phosphatide which might be called a plant or vegetable cephalin. The cadmium chloride salt of animal cephalin is characterized by being soluble in ether. It is hoped that this matter may be definitely settled before long. He has

identified a vegetable mucilage in the crude oil and he cannot obtain any evidence of the presence of a true gum.

Some further work is being done with the resin present in the crude oil. Dr. Jamieson expects to be able to make an interesting report at the coming New Orleans Meeting.

A visit with Dr. Jones of the Protein Investigation Laboratory, elicited the information that Dr. Jones has been doing a lot of work on the proteins of cottonseed meal.

He finds them to be complete proteins from the nutritional point of view. A commercial process for separating them, however, has not yet been devised although he has prepared some very large samples in the laboratory.

Experiments have also been made on the effect of gossypol on digestion *in vitro*.

Some interesting experiments are being made on peanuts from which the oil has been removed by expression. Apparently the peanut kernel contains a food element which is necessary for the ultilization of the peanut protein in the nutrition of animals. This substance occurs in the aqueous extracts of the defatted kernels, and is present in its nutritional effects in small quantities. The nature of this factor has not yet been determined.

Committee: DAVID WESSON (So. Cotton Oil Co., 120 Broadway, N. Y. City), C. B. CLUFF, H. J. MORRISON, L. M. TOLMAN, E. R. BARROW, P. S. TILSON.

(A CONTRIBUTION FROM THE OIL, FAT AND WAX LABORATORY, BUREAU OF CHEMISTRY, U. S. DEPARTMENT OF AGRICULTURE)

CONSTITUENTS OF CRUDE COTTONSEED OIL

BY GEORGE S. JAMIESON AND WALTER F. BAUGHMAN

Further progress in the investigation of the constituents of crude cottonseed oil which was assigned to this laboratory at the conference of the Basic Research Committee and the U. S. Department of Agriculture, September, 1921,* is reported in this paper.

The previous report was devoted chiefly to the results of the examination of the acetone-insoluble portion of the settlings obtained from the oil when it is held several weeks before refining. An analysis for acids and bases of this portion of the settlings gave the following results:

	Per cent
Chlorides	0.00
Silica	0.60
Phosphorus pentoxide	6.14
Sulphates	0.00
Calcium oxide	0.26
Magnesium oxide	1.46
Potassium oxide	1.79

* Previous reports, *The Cotton Oil Press*, 6 (No. 4) 33, 7 (No. 2) 35, 7 (No. 5) 29.

Sodium oxide	0.33
Ferric oxide	trace
Total	10.58

It is believed that the larger part of the bases as well as the phosphorus in the oil are combined with organic compounds some of which, owing to their instability, decompose. As a result, some of the phosphorus and the bases in the settlings are in the form of inorganic phosphates and organic decomposition products.

The settlings were found to contain, besides the constituents previously reported, a phosphatide related to the so-called vegetable lecithins. The phosphatide was first detected in the acetone-insoluble portion of the settlings and later it was found also in the acetone-soluble portion. The addition of a saturated alcoholic solution of cadmium chloride to the alcoholic solution of the settlings gave a light colored precipitate of a compound of cadmium chloride with the phosphatide. After the solution had stood for a day, it was filtered, and the precipitate was washed with alcohol and dried at 120°C. In contrast to the corresponding cadmium chloride compounds of the lecithins obtained from eggs and soy beans, this compound was soluble in ether, in which respect it is similar to the phosphatide cephalin of animal origin. The preparations from the acetone soluble and insoluble portions melted with decomposition at about 194° to 196°C. They contained 15.36% of cadmium and 3.91% of phosphorus (P). The cadmium chloride compound of soy bean lecithin prepared in this laboratory was found to contain 14.7% of cadmium. Gliken's Chemistry of the Fats, Lipoids, and Waxes, vol. 1, p. 420, reports an analysis of the cadmium chloride of a lecithin from animal sources showing that it contained 13.92% of cadmium and 3.09% of phosphorus (P).

After the discovery of the phosphatide in the settlings, an attempt was made to extract it from the crude oil by alcohol. It was hoped that a quantitative extraction might be obtained in view of the known fact that phosphatides are much more soluble in alcohol than in the oil. Methyl alcohol was selected as the solvent because cottonseed oil is much less soluble in it than in ethyl alcohol. The first attempt to extract this phosphatide was made by thoroughly shaking a liter of the oil with 3 successive 1500cc. portions of 99.5% methyl alcohol. The alcoholic extracts were combined and concentrated to a volume of about 300 cc. and allowed to stand at about 12°C. for 3 days. The alcoholic solution was readily decanted from the small quantity of oil which had separated. Cadmium chloride gave a precipitate identical with that obtained from an alcoholic solution of the settlings. An analysis of the untreated crude oil showed that it contained 0.035% of phosphorus (P), while the oil which had been extracted with alcohol contained 0.031% which indicated that the alcohol had removed only 11% of the total phosphorus.

Another portion of the crude oil was extracted nine times, using about the same weight of methyl alcohol for each treatment. In this experiment the oil was not as in the first case simply mixed with the methyl alcohol by shaking, but was rapidly stirred by mechanical means for an hour in each case besides being heated to about 30°C. after the addition of the alcohol. An analysis of the treated oil showed, as nearly as could be determined, that this exhaustive extraction with methyl alcohol had removed only about 15% of the phosphorus in the oil.

The extracted oil was freed from the small quantity of methyl alcohol which it contained and agitated with about 3% of water. During the agitation the mixture was heated to about 55°C. The oil was separated from the resulting precipitate and an extract, with methyl alcohol, of the acetone-insoluble portion of the precipitate gave the characteristic precipitate with an alcoholic solution of cadmium chloride identical with that obtained from the alcoholic extract of the oil. This showed that it was not possible to extract all of this phosphatide from the oil by methyl alcohol. It further indicates that a portion of this phosphatide exists in the oil in chemical combination which on the other hand is at least partially decomposed and removed from the oil by the water-heat treatment.

An experiment was made to determine the percentage of phosphorus removed when the oil is treated with water at room temperatures. While 500 g. of the oil were being rapidly stirred, about 3% of water was slowly added. The mixture was stirred for about an hour with the paddle of the laboratory refining apparatus revolving at 150 revolutions per minute; then it was allowed to stand for about 15 hours. The separated oil was decanted from the emulsion and freed from moisture by filtration through paper, and a phosphorus determination was made. This oil contained 0.032% of phosphorus (P), while the original oil contained about 0.045%, which showed that 29% of the total phosphorus had been removed by the water, as compared with the removal of 15% by the repeated extraction of the oil with alcohol. Another experiment was made in a similar manner except that after the addition of the water to the oil, the mixture was heated to about 55°C. The treated oil contained 0.024% of phosphorus (P) which indicated that this treatment had removed 44% of the phosphorus (P) present in the untreated oil. The caustic soda refining of cottonseed oil on the other hand removes practically all of the phosphorus from the crude oil. An analysis of refined oils showed that they contained from faint traces to 0.003% of phosphorus (P).

As yet no method has been found by which it would be possible to determine the distribution of the phosphorus in the oil between the glyceryl phosphatides, inosite phosphoric acids, etc., nor is there a method by which we can determine the total quantity of any one of these constituents present.

In order to obtain some information as to the quantity of a vegetable phosphatide which could be removed from cottonseed oil by heating with water as described, 500 cc. of refined cottonseed oil which contained 0.003% of phosphorus (P) was treated with a 50cc. ether solution which contained about 0.2 g. of soy bean lecithins. After mixing, the ether was removed by heating. The oil remained clear and brilliant. Experiments were previously made in which after addition of the lecithin directly to the oil the mixture was stirred for long periods and in some cases heated to 50°C., but in no instance was it possible to dissolve measurable quantities. The oil now contained 0.036% of phosphorus (P). After treatment with water and heat, the oil contained 0.024% of phosphorus (P). This experiment showed that 33% of the total phosphorus in the oil as lecithin had been removed by the water treatment. Some of the emulsion which formed when the oil was treated with water and stirred was kept for observation in a test-tube. After standing for 3 months about one-third of the emulsion remained unchanged. A similar experiment could not be made using the phosphatide which is present in the crude cottonseed oil because none of this phosphatide in a free condition had been isolated.

The treatment of the crude cottonseed oil with water and heat further removed the constituents which had been identified in the "settlings" that had previously separated from the oil, but no additional substances have been detected. As might be expected, however, the water-heat treatment partially decomposed some of the phosphatides with the formation of considerable glyceryl-phosphoric acid.

Two attempts were made to determine the percentage of the total substances removed when the crude oil from which the settlings had previously separated was treated with water and heated: Weighed quantities (202 and 650 g.) of this oil were treated with water and heated as described. After the mixture had stood for about 2 days as much as possible of the oil was separated by means of a siphon. In order to remove the rest of the oil floating on the aqueous layer, etc., several 75cc. portions of petroleum ether were added in turn so as not to disturb the lower layer. When the oil had dissolved, the petroleum ether was removed by the siphon. This treatment was repeated until practically all of this oil had been removed. Then the mixture remaining was evaporated to dryness and weighed. In the first experiment in which 202 g. of oil was taken, the residue was 1.64%, and in the second experiment (650 g. of oil) it was 2.7% of the oil treated. These experiments showed that it was impossible to get concordant results by this procedure, owing chiefly to the different quantities of oil being entrained and emulsified with the substances removed by the water treatment. The residue in each case was extracted and washed with petroleum ether until the washings were color-

less. The light yellow granular residues were dried at 110° and weighed. This residue in the first experiment was 0.028% of the original oil and in the second experiment 0.029%. The residues contained inorganic phosphates, glyceryl phosphates and organic phosphates of the inosite phosphate type, along with magnesium and calcium.

Experiments made in another laboratory, in which various samples of crude cottonseed oil were heated with 2% of water and the mixture passed through a super-centrifuge, showed that from 2.0 to 2.85% of the oil treated separated in the form of a thick dark sludge. It was reported that the sludge separated from the various oils contained from about 11 to 25% of oil.

In addition to the further study of the substances which have been discovered thus far, the investigation will be continued in the effort to detect and identify any other substances which may be present in the crude oil.

Summary

Crude cottonseed oil contains in addition to the constituents previously reported a lecithin type of phosphatide which gives an ether-soluble compound with cadmium chloride. This phosphatide can only be partially removed from the oil by extraction with alcohol. It has been found in the "settlings" from this oil. The treatment of the oil with water causes only a partial separation of this phosphatide.

The phosphatides, resins, and presumably other substances present in small quantities in the crude oil have emulsifying properties and are undoubtedly the cause in part for the retention of oil in the soap stock when the oil is refined by caustic soda.

EXTRACTION COMMITTEE REPORT

By G. K. Witmer

I do not occupy as prominent position in the analytical hall of fame as big brother ammonia, but I am extended quite a bit more consideration than little sister moisture, for which I am very deeply thankful. Recent years have witnessed a steady improvement in my various manipulations, and I am exceedingly hopeful that in due time I will earn a position alongside the honorable precision determinations.

If I arrive at the laboratory in the form of hulls, be very sure to mix me thoroughly before selecting a weighing portion. This is one respect in which I am often neglected, and very wrongfully so since I will vary throughout a hull sample much more than in a meal. And do not neglect to search for uncut seeds and meats. In this day of good oil-milling you are apt to ignore their presence, but they are very often to be found, and they are capable of affecting the accuracy of my figures to a very alarming degree.

If I am in the form of cake or meal you must grind me to a reasonable state of fineness, and then mix me very thoroughly. Do not make the mistake of grinding me too finely, for if you do I will pack so closely in the extraction container that the gasoline will be baffled in its efforts to pass uniformly and uninterruptedly through me. Remember that the more finely I am ground the more moisture I lose during the process. Grind me to a texture a little finer than corn-meal and I will respond nobly.

When you weigh me, and I am a hull, please take ten grams. If I am a meal use five grams. You may be accustomed to using less, but the larger amount is much better. Numbers of my chemist friends have changed from the smaller to the larger amounts, but very few indeed have reversed this procedure, which to me is ample proof that the larger amounts are preferable.

And now I may have a little surprise in store for you. I have no genuine preference in the way of containers for the extraction process. I demand accurate results. Give me that and I will tell you that your type of container is good. If you cannot give me accurate figures I will tell you to do some studying and experimenting. If results are still unsatisfactory I might then suggest a change. Fluted filters, paper thimbles, alundum thimbles and wrapped filters in many variations are all good when used with proper comprehension. Above everything, *know your method.*

There are a number of sound varieties of extraction-tubes on the market. The one to which you are accustomed is probably the best in your hands. But don't sneeze at the type your fellow chemist employs. It is probably just as good.

I have, however, a distinct preference for the 50cc. flasks that have become so popular in recent years. They are cheaper, much less subject to change in weight, easier to clean, quicker to cool and much less conducive to consumption of large quantities of gasoline. With a properly rolled Thermos cork it is surprising how little gasoline is required to remove all of my oil. If I am a meal you should get along nicely with 25 cc. Of course if I am a hull, having a larger absorption area, I will require more.

I should like too to put in a little plea for casinghead gasoline. It is much better than redistilled gas-machine gasoline. Its very high percentage of low boiling point fractions makes it admirably suited to my purpose.

It is very difficult to fix any rigid time limit as to what is required to attain complete extraction. Each one of my chemist friends had better settle that for himself. He can easily do so by a little experimentation. When properly set up, one and a half hours should be ample for routine work. A longer time is required for extreme precision. As a matter of fact, however, it is practically impossible to remove all the extractive

matter from me. That is for the reason that I contain certain substances, other than oil, which are so very slightly soluble in gasoline that I will continue to surrender them for days, or even weeks, after the extraction has been apparently completed.

At the completion of the extraction the bulk of the gasoline should be evaporated over the steam or water bath. The small amount remaining may be conveniently removed by rotating the flask, held by tongs, over an open flame. A little dexterity is required for this operation, but it may be very quickly acquired. The presence of the merest trace of gasoline can be readily detected by its odor. If time is not of prime importance the flask may be placed in the oven at 100°C., and at the expiration of three quarters of an hour it may be safely assumed that all of the gasoline has been removed.

Cool the flask for ten or fifteen minutes, according to the oil content, before weighing. However, if an impatient superintendent is waiting on the phone, or there is a train to make, the flask may be immersed, up to the neck, in cold water for a few seconds, wiped thoroughly and weighed at once. In this case the error will be exceedingly slight.

Please give very particular thought and care to the washing and taring of my flasks. Boiling water and soap powder form an admirable cleansing combination. When the interior of the flask has been well mopped with this mixture and then rinsed under running water not the slightest vestige of grease should be detected after drying. Perhaps it might be desirable to tare each flask before use. In routine work, however, this is hardly practicable. As a general rule it may be said that it should be done after each fourth extraction. And then it is well to leave the tare a little light, say 2 mgm., since when this is done the life of the tare will be doubled, as the tendency of the flask is to become lighter, and a plus or minus variation of 2 mgm. is certainly reasonable for routine work.

In conclusion I must insist that the mechanics and chemistry of my determination are neither difficult nor complicated. A little care and a little thought will place me universally on a plane with the most precisely accurate of the classical determinations.

Committee: G. K. WITMER (Battle Laboratory, Montgomery, Ala.), C. H. RICE, W. C. MOOR, H. A. RHINEHALT.

REFEREE EXAMINING BOARD REPORT

By David Wesson

During the past season we have given 16 referee chemists full certification and 7 referee chemists partial certification.

It is suggested that for the coming year all applications for certification should be filed not later than August 1st, so that certificates can be sent out by September 1st. During the past year most of the applications came in June and July. Some little trouble was caused by applicants delaying their requests for certification until the last moment and then complaining that some of their competitors had been certified ahead of them. In order to avoid such trouble in the future, no list of certified chemists will be sent out prior to September 1st so as to appear in the October issue of the *Cotton Oil Press*.

The following have been given full certification for season 1923–1924:

Barrow-Agee Laboratories, Memphis, Tenn.; The Battle Laboratory, Montgomery, Ala.; Chemical and Engineering Co., Chicago, Ill.; Curtis and Tompkins, San Francisco, Calif.; Falkenburg and Co., Seattle, Washington; Fort Worth Laboratories, Fort Worth, Texas; Houston Laboratories, Houston, Texas; Lehman Johnson, Memphis, Tenn.; Law and Company, Atlanta, Ga.; Landon C. Moore, Dallas, Texas; Felix Paquin, Galveston, Texas; D. C. Picard, Birmingham, Ala.; Southwestern Laboratories, Dallas, Texas; H. P. Trevithick, New York, N. Y.; A. G. Sutherland, Columbia, S. C.; Edward G. Williams, New Orleans, La.

The following have been given partial certification for season 1923–1924:

R. M. Chapman, Hammond, Ind.; W. J. Gascoyne, Jr., Baltimore, Md.; I. F. Laucks, Seattle, Washington; McCandless Laboratory, Atlanta, Ga.; Stillwell Laboratories, New York, N. Y.; Wiley and Company, Baltimore, Md.; W. W. Wood, Jacksonville, Fla.

Supplemental Report

The question having arisen that certain chemists who were certified early got more advertising than those who were not certified until the 11th hours, it was decided to arrange to certify chemists in the future at the beginning of the fiscal year, namely, May 1st. It was also found that it would be possible to have all Official Chemists of the Interstate registered in the Book of Rules of the Interstate Cottonseed Crushers' Association. Letters were, therefore, sent out to all Referee Chemists asking them to put in their applications at once and also pay their dues in both organizations so they could be members in good standing and be enrolled as Official Chemists for the coming year.

The plan has worked excellently so far as the American Oil Chemists' Society is concerned. It is a little harder matter to pay the dues of $50.00

to the Interstate Cottonseed Crushers' Association, but as they are only supposed to give two months leeway, as a business proposition it is recommended that all referee chemists who wish to have their names enrolled as Official Chemists of the Interstate in the Rule Book, that they anticipate their payments so as to get them in not later than the latter part of May, which will be in time for the publication of the Rule Book, about the 1st of June. Attached is a list of Referee Chemists who have been certified up to date, also list of chemists who at the present time are members of the Interstate Cottonseed Crushers' Association. The chairman of the Referee Examining Board wishes to thank the Referee Chemists for their hearty coöperation in enabling the Board to get them certified so promptly for the next season.

The question occasionally comes up regarding certification of members working on other oils than those dealt in under the rules of the Interstate Cottonseed Crushers' Association. For instance, some of the people on the coast want to be certified on fish oils, linseed oils, etc. The Referee Board would like to have the opinion of the Society on the certification of chemists on anything outside the products covered by the rules of the Interstate Cottonseed Crushers' Association.

The Referee Examining Board has taken the ground for the last two years that such certifications are not in order except in a special instance.

This whole matter brings up the question as to whether we are to remain just a bunch of cotton oil analysts tied down to the cotton oil industry or whether the American Oil Chemists' Society is to broaden its scope and become recognized as the Fat and Oil Chemists' Society of America. There is room for such a big association and it should cover all kinds of vegetable and animal fats and oils and the products made therefrom, such as soaps, paints and edible materials.

Referee Chemists for Year 1924-1925

The following have been certified on all products dealt in under the rules of the Interstate Cottonseed Crushers' Association:

Barrow-Agee Laboratories, Memphis, Tenn.; The Battle Laboratory, Montgomery, Ala.; Chemical and Engineering Company, Chicago, Ill.; Curtis and Tompkins, San Francisco, Cal.; Falkenburg and Company, Seattle, Washington; Fort Worth Laboratories, Fort Worth, Texas; J. C. P. Helm, New Orleans, La.; P. S. Tilson, Houston, Texas; Lehman Johnson, Memphis, Tenn.; Law and Company, Atlanta, Ga.; Landon C. Moore, Dallas, Texas; J. C. Patrick, Jefferson City, Mo.; Felix Paquin, Galveston, Texas; D. C. Picard, Birmingham, Ala.; Southwestern Laboratories, Dallas, Texas; H. P. Trevithick, New York, N. Y.; and Edward G. Williams, New Orleans, La.

The following have been certified on subjects enumerated:

R. M. Chapman (Cottonseed Meal and Cake), Hammond, Ind.; Gascoyne and Co., Inc. (Cottonseed Meal), Baltimore, Md.; I. F. Laucks (Fish Oils and Oriental Oils), Seattle, Washington; McCandless Laboratory (Cottonseed Meal), Atlanta, Ga.; Stillwell Laboratories (Cottonseed Meal and Soap stock), New York, N. Y.; and Wiley and Company (Cottonseed Meal), Baltimore, Md.

Committee: DAVID WESSON (So. Cotton Oil Co., 120 Broadway, N. Y. City).

MOISTURE COMMITTEE REPORT

BY P. S. TILSON

Quoting our President, Dr. Battle, "The determination of moisture has generally proven a bug-bear to almost every one who has tackled it. Its very simplicity is no doubt the cause of so much variation in results, which we always see in comparing the work of different chemists. It is so easy to weigh out a portion of any material, put it in a bath, let it stay there any reasonable time, take it out, cool and weigh, that few people give it much further thought. It is so easy when we do all this, that we are positive our moisture figures must be right. Also everyone has a pet bath he uses which he knows is correct, and the various steps are so simple that there is no possibility of any confusion, and our figures are so certain that we are willing to swear as to their accuracy. Indeed a moisture determination after all is more of a complementary one, and we usually insert it more for the looks of the thing, than for any real service it may render."

I received my appointment as chairman of this committee last November; in fact this chairmanship or honor came to me at this late date by default. After accepting this chairmanship I advised our President that this committee would give its sole attention to procuring if possible an oven of uniform as well as constant temperature—for without this as a starter nothing of a worthwhile nature could be accomplished along the lines of coöperative moisture work. In line with this thought there was sent out a questionnaire in order to ascertain whether or not the members of our Society actually knew the nature of the moisture oven they were using and also to ascertain how many possessed a moisture oven of uniform as well as constant temperature. Out of 48 replies received. to this questionnaire besides Dr. Richardson's Labs. only four reported that they had a uniform and constant temperature oven that met the requirements of our official methods. Some of those who filled in the questionnaire reported that their moisture ovens varied from 83° to 131°. Can you wonder at the variations shown in moisture determinations as set forth in the Smalley Foundation, check meal work?

A letter was addressed to all manufacturers of electrical control ovens asking them if they would undertake to manufacture an oven of uniform and constant temperature at a moderate cost of $75.00 to $100.00 each, giving them the following specifications: "In general the requirements of this oven are as follows: one shelf about 16 inches square or its equivalent, space above this shelf not less than 6 inches, temperature on all parts of this shelf—corners, centers, etc.—shall be 102°C. plus or minus one degree and must remain so whether the oven is empty, full or partially full of moisture dishes, etc.; this oven must be well ventilated; the price must not exceed $100.00 and the oven must be electrically heated and controlled; it must not require more than one hour in reaching the above temperature and remaining constant." Our object was to avoid a jacketed oven containing liquids. To these inquiries two companies agreed to undertake the above; they were The Thermo Electric Instrument Co., Newark, N. J., and The Chicago Surgical and Electrical Co., Chicago, Ill. Just what some of the other companies had to say in this matter and in reply to this letter we quote below.

E. H. Sargent, of Chicago, says: "We do not believe that you will be able to find and certainly we are not in a position to furnish you with an oven even nearly approaching to your specifications and certainly not for $75.00." The Chicago Surgical & Electrical Company, of Chicago, says: "There is no oven in our regular line of apparatus, that could be used for your purpose."

Eimer and Amend, of New York, says: "We regret to report that we are not in a position to quote you an inexpensive oven to meet your specifications."

The Apparatus & Specialty Company, of Lansing, Michigan, says: "All of these ovens have the same disease of not being the same temperature at all points on one level."

Hear also what Dr. Baxter, of Harvard University, who has done research work along this line quite extensively says: "I appreciate the difficulties which you are having with electric ovens and wish very much that I could help you, but I am afraid that my experience has not allowed me to find a remedy for the difficulty which you are having."

Your attention is again called to Mr. L. M. Tolman's very able article on the "Determination of Moisture in Check Meals," printed in the March, 1923, number of the *Cotton Oil Press*. From his summary of information received you gather a very accurate idea of the wide variation of results reported by drying at different temperatures all of which more firmly impresses upon us the necessity of our Society adopting a uniform moisture box and not only a uniform box but one of uniform and constant temperature.

Perhaps no member of our Society has given more thought and study

to this perplexing problem than Dr. W. D. Richardson, Chief Chemist, Swift and Company, Chicago. What Dr. Richardson has to say at this time along this line we quote you below:

"Referring to your questionnaire in regard to moisture oven: we solved this problem, so far as our own laboratories are concerned, a number of years ago by the introduction of a standard jacketed oven which maintains a very constant temperature by means of a glycerine water solution in the jacket which is heated by electric coils. Any other source of heat might be used.

"When I was chairman of the Moisture Committee, an immense amount of work was done in this laboratory on moisture determination. All types of ovens and methods were used, desiccation *in vacuo* over sulphuric acid, ordinary air ovens heated in various ways and controlled in various ways, vacuum ovens, tube ovens, using hydrogen, CO_2, nitrogen, etc., and jacketed ovens. A report of this work was made during several successive years to the American Oil Chemists' Society, and finally a blueprint of the oven recommended was delivered to the Society. A number of copies of this blueprint were distributed to members. No action was taken by the Society.

"The problem is not to determine the moisture in cotton-seed meal, since by any method free moisture is not entirely driven off before moisture of combinations begins to be removed and the one determination runs into the other. At any rate, moisture in small amounts, say 0.1 to 0.2% between weighings, continues to come off for a very long period of time. The problem then is to arrive at a figure closely approximating the free moisture by a simple and direct method, which in the hands of different analysts gives concordant results.

"This can be accomplished by the oven referred to, blueprint of which is enclosed. We have installed this oven in our fifteen branch laboratories and the results on check samples which are sent out every month are very good indeed, considering the innate inaccuracy of any moisture determination on such organic materials as cotton-seed meal, fertilizers and stock feeds.

"I am taking the liberty of answering your questionnaire in this way since I can thus convey to you a better idea of work done in the past and the present situation so far as our own laboratories are concerned.

"We can furnish one of these ovens complete with electrical heating units for $125.00, in dozen lots $100.00 each."

Dr. Richardson also shows that with uniform ovens in the hands of sixteen different chemists in sixteen different laboratories on a sample of dried blood that the moisture content gave only a maximum variation of plus or minus 0.3% from the average.

Under date of April 18th, The Thermo Electric Instrument Company

advised that they had been successful in manufacturing an oven that would meet all of the above requirements. They further say, "that after testing this oven for a number of days, we found that the temperature as obtained at six different points widely distributed on the shelf level, with the shelf loaded with twelve regular aluminum moisture dishes, was within 101°C. and 103°C. at all times.

"The price of this oven will be $80.00 f.o.b. Newark, N. J., if the members of your Society will buy this oven directly through our factory sales organization rather than through laboratory apparatus and other types of jobbing houses."

This oven was shipped to my laboratories and thoroughly tested out, both for uniform and constant temperature, and our daily records of the test are given in the table below.

The oven was operated in the Houston Laboratories from Thursday, April 24th to Thursday, May 1st, inclusive, except Sunday. Six thermometers were used, one in each of the four corners and one each in right and left center, resting in standard moisture dishes. The oven was loaded with from 6 to 36 standard moisture dishes on different days during the week.

Temperatures

	1 L-B	2 L-F	3 L-C	4 R-C	5 R-B	6 R-F
Maximum temperature	106°	103°	102°	101.5°	103°	102°
Minimum temperature	102.2	101	100	100	101	101
Average temperature	103.7	101.9	101.4	100.4	102.3	101.7

Moisture determinations on C. S. Meal

	Electric oven —3 hours			Water jacket drying oven—6 hours temperature 98°		
	Max. %	Min. %	Av. %	Max. %	Min. %	Av. %
Sample No. 1	9.53	9.40	9.48	9.28	9.28	9.28
Sample No. 2	6.73	6.37	6.55	6.40	6.33	6.37
Sample No. 3	9.33	9.27	9.30	9.38	9.20	9.29
Sample No. 4	10.90	10.44	10.69	10.80	10.55	10.67
Sample No. 5	9.49	9.15	9.30	9.23	9.20	9.22

The manufacturers have remedied the defect shown in the table (temperature 106 degrees) and Mr. Freas is here with one of the ovens for your inspection. I consider that this oven—so far as tested—comes as near meeting the specified conditions as is possible to construct a moderate price oven, and at $80.00 each it is within reach of most laboratories. I believe the first step of our problem has been solved. The committee asks that our Society recommend to the Chemist Committee for adoption this oven, as well as all other ovens of uniform and constant temperature that meets the standard requirements of our official methods.

Committee: P. S. TILSON (Houston Laboratories, Houston, Texas), H. S. BATTLE, R. D. CALDWELL, GLENN NOGGLE, W. D. RICHARDSON, H. C. MOORE.